



June 3, 2022

Honorable Michael L. Parson
Governor
State of Missouri

MSSC 2021 Report on the State of Missouri's Earthquake Preparedness For Major Earthquakes

Dear Governor Parson:

In 1995, the Missouri Seismic Safety Commission (MSSC) was established, consisting of 17 members -- 15 appointed professionals from architecture, planning, fire protection, public utilities, electrical engineering, mechanical engineering, structural engineering, soils engineering, geology, seismology, local government, insurance, business, the American Red Cross and emergency management, one Missouri House appointed member and one Missouri Senate appointed member to work with various levels of government to help Missourians take steps to prepare for and reduce the effects of an earthquake. The mission of the MSSC is to review Missouri's current preparedness for major earthquakes and to make recommendations to mitigate their impact. This report summarizes the activities conducted by Commission's Members during 2021 in executing that mission.

Missouri Seismic Safety Commissioners volunteer to serve until replaced by newly appointed representatives. The commission continues to struggle with appointing new members to the commission. All but two of the existing commissioners are serving on expired appointments, however, the greatest need is to appoint new members to the vacant positions. The following is a list of currently serving commissioners – as you can see, there are a large number of vacant positions:

Representing	Name	Term Ends
Electrical Engineering	Dr. Philip Gould, PE	Term Expired July 1, 2012
Fire Protection	Mr. John Mallott	Term Expired July 1, 2020
Insurance	Vacant	Term Expired July 1, 2012
Local Government	Mr. Joel P. Evans	Term Expired July 1, 2020

Public Utilities	Mr. Daryl Sorrell	Term Expires July 1, 2022
Seismology	Dr. Eric Sandvol	Term Expired July 1, 2020
Soils Engineering	Dr. Raymond Bailey, RG, PE	Term Expired July 1, 2020
Planning	Vacant	
Soils Engineering	Dr. Brent Rosenblad	Term Expires July 1, 2022
Public Education	Vacant	
Mechanical Engineering	Vacant	
American Red Cross	Vacant	
Geology	Vacant	
Business	Vacant	
Emergency Management	Vacant	
House Appointed Member	Rep. Jamie Burger	
Senate Appointed Member	Senator Jason Bean	

The State of Missouri has taken important steps to prepare for and reduce the effects of a major earthquake as reflected in the Strategic Plan for Earthquake Safety in Missouri, first published by the MSSC in 2007. The MSSC has begun work to update this strategic plan in terms of more recent events and activities of the commission. The report presented below summarizes the activities of the commission during 2021 in the continued implementation and support of this plan and highlights the current preparedness efforts to mitigate the effects of a major earthquake.

On November 18, 2021 the largest earthquake in 30 years in the state of Missouri occurred near Williamsville (Figure 1). This earthquake was felt throughout southeastern Missouri and serves as a reminder that we have significant seismic hazard in the state. The earthquake occurred well within the New Madrid Seismic Zone (NMSZ). More than 5,200 people felt this seismic event. The majority of reports to the USGS came from citizens in Missouri, Arkansas, and Tennessee, with the most intense shaking felt in the Poplar Bluff area. Many people on social media also reported feeling the earthquake.

The earthquake occurred at a depth of about 14 kilometers, or about 9 miles, below the surface of the earth. This is where most of the earthquakes in the NMSZ occur: in the upper part of the earth's crust. The intensity of the ground shaking can be

seen in Figure 1; this plot would suggest that sediments to the southwest of the earthquake amplified the ground shaking.

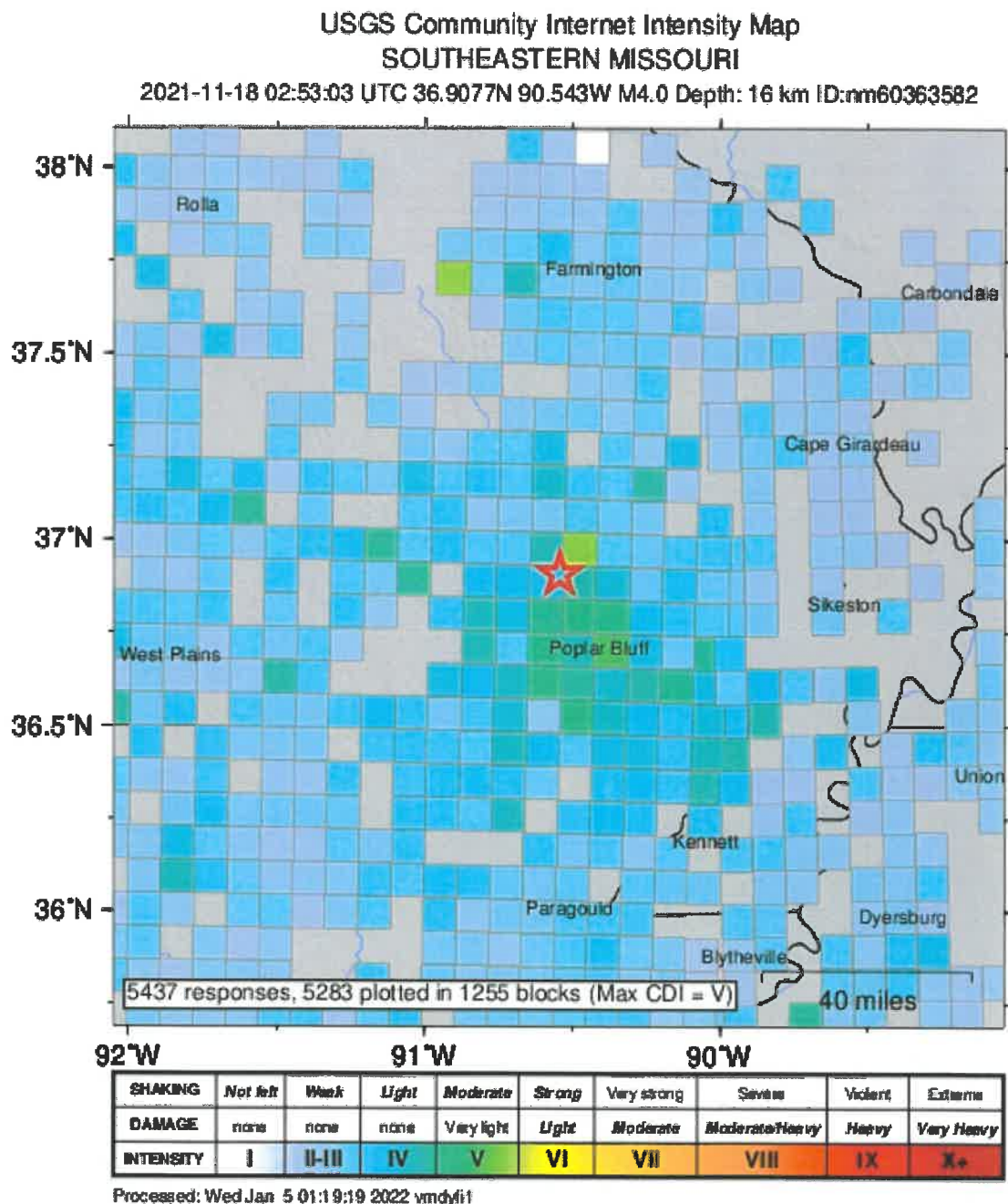


Figure 1. The USGS's community impact map from the November 18th 2021 Poplar bluff earthquake. Even though relatively small, this earthquake still produced moderate level shaking across a significant portion of southeastern Missouri.

Past earthquakes have caused great damage in the central region of the United States, and there is broad agreement in the scientific community that there is a continuing concern for a major earthquake that would put structures and communities in Saint Louis and southeast Missouri vulnerable to damage from severe ground shaking. An open file report from the United States Geological Survey has reaffirmed that there is

significant reason to plan for a significant seismic event in the New Madrid Seismic Zone.

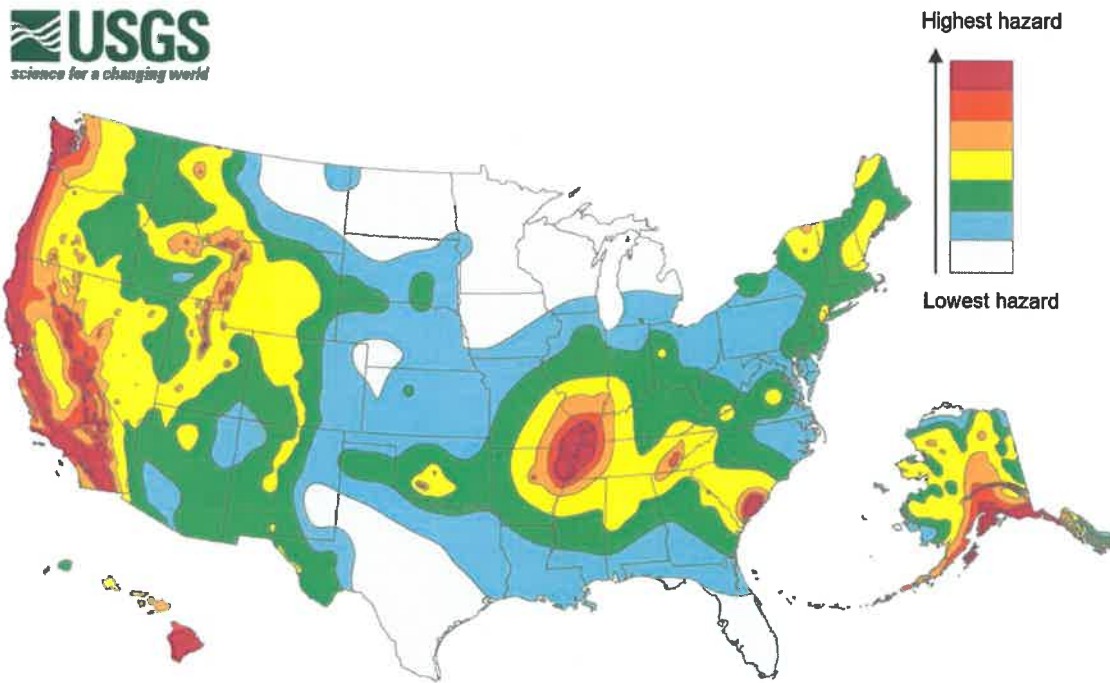


Figure 2. The 2018 USGS long term earthquake hazard map for the United States. Note the long term seismic hazard in southeast Missouri is the same as that for California or Alaska. Recent updates to this map have not reduced the USGS’s estimated hazard for the New Madrid Seismic Zone.

MSSC RVS Program

The Missouri Seismic Safety Commission is leading a very important program to improve earthquake safety and readiness in Missouri schools. The Commission works with structural engineers, architects, and construction professionals to conduct “rapid visual screenings” for potential seismic hazards of school buildings. These screenings:

- Are provided free of charge to participating school districts
- Help determine earthquake-readiness of school buildings and district facilities
- Provide preliminary recommendations to improve school safety
- Can be used to prioritize structural retrofit or non-structural improvements
- Use FEMA-approved methodology known as “FEMA P-154”

To date, 23 school districts in southeast Missouri have been evaluated through this program.

The earthquake threat to Missouri cannot be ignored. The Strategic Plan for Earthquakes in Missouri developed tangible, practical recommendations and

procedures to prepare Missouri for future earthquakes as well as other hazards, such as tornadoes and strong storms, at the same time. This consisted of Five Objectives with specific implementation strategies. MSSC commissioners met once each quarter to evaluate current progress in achieving the goals as indicated below.

Objective 1: Increase Earthquake Awareness and Education

Strategy 1.1 - Promote Awareness among the general public.

COVID-19 has impacted the commission efforts in this area substantially, however the MSSC continue to make efforts to promote earthquake awareness in 2021. Here is a list of specific activities:

- February 2021 was Earthquake Awareness Month in Missouri and was highlighted by presentations, media coverage, social media activities and demonstrations throughout the state.
- A series of virtual Earthquake Summit webinars also took place in February 2021, with more than 1,000 attendees.
- Over the course of the year a few updates were made to the MSSC website (<http://mssc.missouri.edu/>) providing Missourians access to earthquake information and updates on disaster preparedness.
- 10/22 The Great Central U.S. ShakeOut earthquake drill was held throughout the region, with more than 350,000 registered participants in Missouri.



Figure 3. Example of a field report and team from the MSSC's Rapid Visual Screening program.

Strategy 1.2 - Promote Awareness among key professionals in critical fields.

- 4/21 Chairman met with the Missouri Geologists Consortium in order to discuss how to make the MSSC more effective and appoint new commissioners
- 10/2 Missouri's Structural Assessment and Visual Evaluation (SAVE) Coalition exercised during a simulated earthquake at Jefferson Barracks in St.

Louis. More than 100 members participated, including National Guard partners.

- 10/21 As part of the ShakeOut earthquake drill, Jeff Briggs conducted media events.

Objective 2: Reduce Earthquake Hazard Through Mitigation

Strategy 2.1 - Promote adoption/enforcement of technically sound & feasible building codes.

- Monitored and offered support for the establishment of local building standards.

Strategy 2.2 – Identify existing essential facilities and schools susceptible to EQ damage.

The MSSC continued its study using volunteers to conduct a Rapid Visualization Screening (RVS) that reported on the vulnerability of school facilities to failure in a seismic or high wind event (Figure 3). The study identified the vulnerability of a majority of the older school facilities in the southeastern region of Missouri, noted inexpensive corrections that should reduce school children's and staff person's morbidity and mortality from future earthquakes, and recommended that the school districts in the 46 counties in southeastern Missouri that are considered to be "at risk" from a major earthquake request an enhanced Rapid Visual Assessment (RVA) screening under the auspices of MSSC using volunteer professionals provided by professional societies or contract for an evaluation by a qualified engineer. During 2021:

- The MSSC unanimously voted to accept the Hayti R-II school assessment.
- The MSSC has agreed that a RVS database will be housed at SEMA and will continually be updated as additional evaluations are completed.
- In addition to the creation of reports, the MSSC commissioners have conducted follow up visits for past RVS visits. The visits are designed to monitor and encourage mitigation efforts at the Schools that we have conducted a RVS visit and generated an extensive report. These visits also help the MSSC to understand how to better aid school districts in preparing for major seismic events.

Objective 4: Improve Recovery

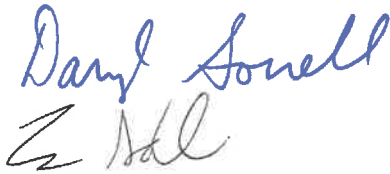
Strategy 4.3 – Promote funding and training of post-earthquake building inspection.

- MSSC received FEMA funds to support travel expenses for volunteers and support staff to coordinate the assignment of teams to conduct Rapid Visual Assessment (RVA) screening evaluations and training for team leaders.

- MSSC revised strategic planning including efforts to help improve recovery efforts after a major earthquake

Major earthquakes in the central US are rare, but can affect a large geographical area, challenging the state resources to respond. The lessons learned from past U.S. earthquakes have demonstrated the significant burden placed on surviving families, businesses, utilities and state agencies. Preparation in the short term will yield significant reductions in fatalities, casualties, damaged structures, business failures, and state infrastructure losses from earthquakes. The same actions will also reduce the impact of other natural hazards. The MSSC will endeavor to continue making progress towards achieving the objectives presented in the Strategic Plan for Earthquake Safety during the next twelve months.

Respectfully submitted,

The image shows two handwritten signatures in blue ink. The top signature is 'Daryl Sorrell' and the bottom signature is 'Eric Sandvol'.

Daryl Sorrell and Eric Sandvol
2022 Chairman and Vice Chairman, Missouri Seismic Safety Commission